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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/523,846	02/21/2006	Adrian Boyle	37389-403800	4369

7590 02/22/2007  
Timothy J Keefer  
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55 E Monroe Street  
Chicago, IL 60603-5863

EXAMINER
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AHMED, SHAMIM

ART UNIT	PAPER NUMBER
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1765

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	02/22/2007	PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

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<b>Office Action Summary</b>	<b>Application No.</b> 10/523,846	<b>Applicant(s)</b> BOYLE ET AL.	
	<b>Examiner</b> Shamim Ahmed	<b>Art Unit</b> 1765	

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 07 February 2005.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-7 and 9-25 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-7 and 9-25 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 07 February 2005 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |   |   |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)  | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date <u>2/7/05</u> . | 6) <input type="checkbox"/> Other: _____  |

**DETAILED ACTION**

***Claim Rejections - 35 USC § 102***

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1,2,7,9-11 are rejected under 35 U.S.C. 102(b) as being anticipated by Lim P. et al ("Laser-assisted liquid film etching").

Lim P. et al disclose an apparatus and a method of machining a silicon body with a green visible wavelength laser comprising:

- providing a liquid halide environment such as hydrofluoric acid at the location of the machining location on the silicon body by condensing a HFA vapor;
- directing the laser beam at the machining location to cause a chemical reaction between the silicon at the machining location with the laser beam;
- venting any gaseous by-products from the environment of the liquid halide compound and dispensing any solid-by-products in the liquid halide compound (see pages 3345-3346 and figures 1-2).

***Claim Rejections - 35 USC § 103***

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the

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invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

5. Claims 1-7 and 9-14 and 16-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Russell et al (5,266,532) in view of Ikegami et al (6,720,522) and Lim P. et al.

Russell et al disclose a system and process using an ultraviolet (UV) laser assisted technique in a gaseous halocarbon silicon etching process, wherein a chemical reaction occurs between the silicon and the halocarbon such as  $\text{CF}_4$  and producing gaseous and solid reaction products (col.4, lines 13-27).

Russell et al teach removal of reaction product is performed via pumping station (col.6, lines 20-32 and figure 2).

Russell et al fail to disclose that a liquid halide environment is established and directing the laser beam through the liquid environment, which locally heating the liquid compound in the vicinity of the machining location of the silicon substrate.

However, Ikegami et al (6,720,522) disclose a process and apparatus for laser beam machining, wherein the beam is directing to the silicon substrate through a liquid environment (col.3, lines 19-25).

Ikegami et al also disclose that in gaseous environment, the irradiated area of the silicon substrate having silicon grains scattered by laser beam machining and adhered to the machined surface, which causes reduced manufacturing yield (col.2, lines 6-9 and col.3, lines 8-17).

Ikegami et al further teach that the target surface is covered with the liquid in order to remove the heat and suppress the influence of vapor more efficiently than heat caused locally by the irradiation of the laser beam at the machining location (col.7, lines 1-5 and lines 35-45).

Ikegami et al teach that the system is equipped with a pump for removing the dust and particles produced in the machining process (col.7, lines 6-22), which teaching reads on the claimed limitation of venting the gaseous by-product from the liquid environment.

Therefore, it would have been obvious to one of ordinary skill in the art at the time of claimed invention to employ Ikegami et al's teaching into Russell et al's teaching for efficiently machining the silicon substrate with reduced contamination as taught by Ikegami et al.

Modified Russell et al with Ikegami et al may not explicitly teach that the liquid environment includes halide environment, whereas Ikegami et al teach that any kind of

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liquid can be used that is capable of absorb heat generated by the laser beam in and near the irradiation area or machining location as claimed (col.6, lines 51-55).

However, Lim P. et al teaches above in the paragraph 2, specifically halide liquid (hydrofluoric acid) environment is performed to efficiently etch silicon material (page 3345).

Therefore, it would have been obvious to one of ordinary skilled in the art at the time of claimed invention to employ Lim P. et al's teaching into modified Russell et al's process for efficiently etching or machining as suggested by Lim P. et al.

6. Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Russell et al (5,266,532) in view of Ikegami et al (6,720,522) and Lim P. et al. and further in view of Yamazaki (JP-59225896).

Modified Russell et al discusses above in the paragraph 5 but fail to teach the apparatus include a liquid chamber environment comprises a refrigerated liquid.

However, Yamazaki illustrates a silicon machining process and apparatus including a liquid Freon compound environment in at least in the machining location (see the abstract).

Therefore, it would have been obvious to one of ordinary skilled in the art at the time of claimed invention to use refrigerated liquid such as liquid Freon for particle free etched feature as suggested by Yamazaki.

***Conclusion***

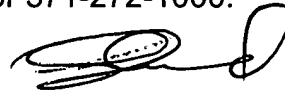
7. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Douglas et al (5,312,516) teach an etching process a semiconductor substrate including the step of irradiating laser beam with visible or ultraviolet radiation through a liquid comprises halide environment (see at least abstract); Kawamoto et al (2002/0061647) discuss that HF react with silicon-containing layer to produce reaction product that can be evacuated from the reaction chamber (see paragraph 0012).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Shamim Ahmed whose telephone number is (571) 272-1457. The examiner can normally be reached on M-Thu (7:00-5:30) Every Friday Off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine G. Norton can be reached on (571) 272-1465. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.



Shamim Ahmed  
Primary Examiner  
Art Unit 1765

SA  
February 16, 2007